

According to the California Commercial End-use Survey completed in 2006, **exterior and interior lighting** accounts for almost **50%** of all electrical energy use in California schools.

### **California Commercial End-use Survey Results**

<http://capabilities.itron.com/CeusWeb/Chart.aspx>

### **Lamp Type**

Most lighting in schools comes from incandescent or fluorescent bulbs. Incandescent bulbs are most common in homes and can generally be identified by the presence of a filament. These bulbs convert 10% of the energy used to light and 90% of the energy used to heat. This low efficiency makes them excellent candidates for replacement.

Fluorescent bulbs use 75% less energy than incandescent to produce the same amount of light because they are more efficient and convert less energy to heat.

Fluorescent bulbs are labeled with a series of letter and number which provide information about that bulb. This label always begins with "F" to indicate fluorescent. The next two digits tell the input power in number of watts. Next, a letter tells the lamp type: T=tubular, C=circular, U=u-shaped. The next number indicates how many 1/8 inches there are in the diameter of the bulb.

### **EXAMPLE: F32T8**

This means a fluorescent bulb (F) that uses 32 watts of power (32) with a tubular shape and a diameter of 1 inch (8 x 1/8".)

### **Ballast Type**

Fluorescent lights can be electronically or magnetically ballasted. You can differentiate between the two types by either using a flicker-checker or an electronic tool. A flicker checker is plastic disc with patterns on it that you spin like a top. If you see colors and rotation in both directions while it spins, the lights you are under have magnetic ballasts. If you only see shades of gray and unidirectional spin, the lights have electronic ballasts. Electronic ballasts are more energy efficient and have much less flicker.

The link below is available at the PG&E website and includes specific information on all types of lamps, including incandescent, fluorescent and CFLs:

### **Table of Standard Fixture Wattages and Sample Lighting Table**

<http://www.aesc-inc.com/download/spc/2011SPCDocs/UnifiedManual/App%20B%20Standard%20Fixture%20Watts.pdf>

### **Measuring Illuminance**

FOOTCANDLE (fc)- A unit of measure of illuminance.

A unit of illuminance on a surface that is one foot from a uniform point source of light of one candle and equal to one lumen per square foot. One footcandle is equal to 1 lumen cast per sq. ft. of surface.

Examples:

- A sunny day can measure between 5,000 fc and 10,000 fc.
- An average living room measures about 30 fc.
- A full moon can provide 0.2 fc of illumination.

\* You will need a handheld illuminance meter to read the actual illuminance level in various parts of the room. This can be compared to recommended levels based on the task being performed. The table on pg. 3 provides guidelines for levels of illuminance based on the tasks performed in the space.



*Probe Sold Separately*

\* The Omega 4-1 meter includes a light meter that reads in foot candles and is very easy for middle school students to use.

Type of Activity	Illuminance Category	Ranges of Illuminances		Reference Workplane
		Lux	Footcandles	
Public spaces with dark surroundings	A	20-30-50	2-3-5	General lighting throughout spaces
Simple orientation for short temporary visits	B	50-75-100	5-7.5-10	
Working spaces where visual tasks are only occasionally performed	C	100-150-200	10-15-20	
Performance of visual tasks of high contrast or large size	D	200-300-500	20-30-50	Illuminance on task
Performance of visual tasks of medium contrast or small size	E	500-750-1000	50-75-100	
Performance of visual tasks of low contrast or very small size	F	1000-1500-2000	100-150-200	
Performance of visual tasks of low contrast and very small size over a prolonged period	G	2000-3000-5000	200-300-500	Illuminance on task, obtained by a combination of general and local
Performance of very prolonged and exacting visual tasks	H	5000-7500-10000	500-750-1000	(supplementary lighting)
Performance of very special visual tasks of extremely low contrast and small size	I	10000-15000-20000	1000-1500-2000	

Taken from 1987 Application Volume of the IES Lighting Handbook